

WHAT IS CLAIMED IS:

1. An isolated nucleic acid encoding a *Thermus scotoductus* strain X-1,
ATCC Deposit No. 27978, nucleic acid polymerase.
5
2. The isolated nucleic acid of claim 1 wherein the nucleic acid polymerase
is a DNA polymerase.
3. An isolated nucleic acid encoding a nucleic acid polymerase comprising
any one of amino acid sequences SEQ ID NO:13-28.
10
4. An isolated nucleic acid encoding a derivative nucleic acid polymerase
comprising any one of amino acid sequences SEQ ID NO:13-16 having a
mutation that decreases 5-3' exonuclease activity.
15
5. The isolated nucleic acid of claim 4, wherein the derivative nucleic acid
polymerase has decreased 5-3' exonuclease activity relative to a nucleic
acid polymerase comprising any one of amino acid sequences SEQ ID
NO:13-16.
20
6. An isolated nucleic acid encoding a derivative nucleic acid polymerase
comprising any one of amino acid sequences SEQ ID NO:13-16 having a
mutation that reduces discrimination against dideoxynucleotide
triphosphates.
25
7. The isolated nucleic acid of claim 6, wherein the derivative nucleic acid
polymerase has reduced discrimination against dideoxynucleotide
triphosphates relative to a nucleic acid polymerase comprising any one of
amino acid sequences SEQ ID NO:13-16.
30
8. An isolated nucleic acid encoding a nucleic polymerase comprising any
one of SEQ ID NO:1-12.
9. An isolated nucleic acid comprising a nucleotide sequence
complementary to any one of SEQ ID NO:1-12.
35

10. A vector comprising an isolated nucleic acid encoding a *Thermus scotoductus* strain X-1, ATCC Deposit No. 27978, nucleic acid polymerase.
- 5 11. The vector of claim 10 wherein the nucleic acid polymerase is a DNA polymerase.
12. A vector comprising an isolated nucleic acid encoding a nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-28.
- 10
13. A vector comprising an isolated nucleic acid encoding a derivative nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16 having a mutation that decreases 5-3' exonuclease activity.
- 15
14. The vector of claim 13, wherein the derivative nucleic acid polymerase has decreased 5-3' exonuclease activity relative to a nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16.
- 20
15. A vector comprising an isolated nucleic acid encoding a derivative nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16 having a mutation that reduces discrimination against dideoxynucleotide triphosphates.
- 25
16. The vector of claim 15, wherein the derivative nucleic acid polymerase has reduced discrimination against dideoxynucleotide triphosphates relative to a nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16.
- 30
17. A vector comprising an isolated nucleic acid encoding a nucleic polymerase comprising any one of SEQ ID NO:1-12.
- 35 18. An expression vector comprising a promoter operably linked to an isolated nucleic acid encoding a *Thermus scotoductus* strain X-1, ATCC Deposit No. 27978, nucleic acid polymerase.

19. The vector of claim 19 wherein the nucleic acid polymerase is a DNA polymerase.
- 5 20. An expression vector comprising a promoter operably linked to an isolated nucleic acid encoding a nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-28.
- 10 21. An expression vector comprising a promoter operably linked to an isolated nucleic acid encoding a derivative nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16 having a mutation that decreases 5-3' exonuclease activity.
- 15 22. The expression vector of claim 21, wherein the derivative nucleic acid polymerase has decreased 5-3' exonuclease activity relative to a nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16.
- 20 23. An expression vector comprising a promoter operably linked to an isolated nucleic acid encoding a derivative nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16 having a mutation that reduces discrimination against dideoxynucleotide triphosphates.
- 25 24. The expression vector of claim 23, wherein the derivative nucleic acid polymerase has reduced discrimination against dideoxynucleotide triphosphates relative to a nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16.
- 30 25. An expression vector comprising a promoter operably linked to an isolated nucleic acid encoding a nucleic polymerase comprising any one of SEQ ID NO:1-12.
- 35 26. A host cell comprising an isolated nucleic acid encoding a *Thermus scotoductus* strain X-1, ATCC Deposit No. 27978, nucleic acid polymerase.

27. The host cell of claim 26 wherein the nucleic acid polymerase is a DNA polymerase.
28. A host cell comprising an isolated nucleic acid encoding a nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-28.
29. A host cell comprising an isolated nucleic acid encoding a derivative nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16 having a mutation that decreases 5-3' exonuclease activity.
30. The host cell of claim 29, wherein the derivative nucleic acid polymerase has decreased 5-3' exonuclease activity relative to a nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16.
31. A host cell comprising an isolated nucleic acid encoding a derivative nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16 having a mutation that reduces discrimination against dideoxynucleotide triphosphates.
32. The host cell of claim 31, wherein the derivative nucleic acid polymerase has reduced discrimination against dideoxynucleotide triphosphates relative to a nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16.
33. A host cell comprising an isolated nucleic acid encoding a nucleic polymerase comprising any one of SEQ ID NO:1-12.
34. An isolated DNA polymerase polypeptide from *Thermus scotoductus* strain X-1, ATCC Deposit No. 27978.
35. The isolated nucleic acid polymerase of claim 34 wherein the nucleic acid polymerase is a DNA polymerase.

36. An isolated nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-28.
- 5 37. An isolated nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16 having a mutation that decreases 5-3' exonuclease activity.
- 10 38. The isolated nucleic acid polymerase of claim 37, wherein the derivative nucleic acid polymerase has decreased 5-3' exonuclease activity relative to a nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16.
- 15 39. An isolated nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16 having a mutation that reduces discrimination against dideoxynucleotide triphosphates.
- 20 40. The isolated nucleic acid polymerase of claim 39, wherein the derivative nucleic acid polymerase has reduced discrimination against dideoxynucleotide triphosphates relative to a nucleic acid polymerase comprising any one of amino acid sequences SEQ ID NO:13-16.
- 25 41. A kit comprising a container containing a nucleic acid polymerase, wherein the nucleic acid polymerase comprises any one of amino acid sequences SEQ ID NO:13-28.
- 30 42. The kit of claim 41 further comprising a container containing an unlabeled nucleotide, a labeled nucleotide, a balanced mixture of nucleotides, a chain terminating nucleotide, a nucleotide analog, a buffer solution, a solution containing magnesium, a cloning vector, a restriction endonuclease, a sequencing primer, a solution containing reverse transcriptase, or a DNA or RNA amplification primer.
- 35 43. The kit of claim 41, adapted for performing DNA sequencing, DNA amplification, reverse transcription, RNA amplification or primer extension.

44. A method of making a nucleic acid polymerase comprising any one of SEQ ID NO:13-28 that comprises, incubating under conditions sufficient for RNA transcription and translation a host cell comprising a nucleic acid encoding a polypeptide comprising any one of SEQ ID NO:13-28 operably linked to a promoter.
45. The method of claim 44 wherein the nucleic acid comprises any one SEQ ID NO:1-12.
46. A nucleic acid polymerase made by the method of claim 44.
47. A method of synthesizing DNA comprising contacting a polypeptide comprising any one of SEQ ID NO:13-28 with a DNA under conditions sufficient to permit polymerization of DNA.
48. A method for thermocyclic amplification of nucleic acid comprising:
(a) contacting a nucleic acid with a thermostable polypeptide having any one of SEQ ID NO: 13-28 under conditions suitable for amplification of said nucleic acid; and
(b) amplifying the nucleic acid.
49. The method of claim 48 wherein the thermocyclic amplification of the nucleic acid includes cycles of denaturation, primer annealing and primer extension.
50. The method of claim 48 wherein the thermocyclic amplification of the nucleic acid is performed by Strand Displacement Amplification.
51. The method of claim 48 wherein thermocyclic amplification of the nucleic acid is performed by Polymerase Chain Reaction.
52. A method of primer extension comprising contacting a polypeptide comprising any one of SEQ ID NO:13-28 with a primer and a nucleic acid that is complementary to the primer under conditions sufficient to permit polymerization of DNA.
53. The method of claim 52 wherein the nucleic acid is DNA.

54. The method of claim 52 wherein the primer extension is done to sequence the nucleic acid.

5 55. The method of claim 52 wherein the primer extension is done to amplify the nucleic acid.